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The French Viticultural Mission to the United States.

REPORT TO THE MINISTER OF AGRICULTURE

BY M. PIERRE VIALA,
PROFESSOR OF VITICULTURE AT THE NATIONAL AGRICULTURAL SCHOOL
AT MONTPELIER,

Discussing the relative immunity from disease of the native American Grape Vines,
and their adaptability for grafting stocks for the preservation of the French
Vineyards from the ravages of Phylloxera, and showing that this
can only be done by grafting upon native Texas vines.

TRANSLATED FOR THE TEXAS STATE GEOLOGICAL AND SCIENTIFIC
ASSOCIATION
BY JUSTINA ROBINSON HILL,

WITH AN INTRODUCTION AND EXPLANATORY GEOLOGICAL NOTE
BY ROBERT T. HILL,
OF THE UNITED STATES GEOLOGICAL SURVEY.

HOUSTON, TEXAS, July, 1888.
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THE FRENCH VITICULTURAL MISSION TO THE UNITED STATES. *Report to the Minister of Agriculture, by* M. PIERRE VIALA, Professor of Viticulture at the National Agricultural School of Montpelier. *Translated by* JUSTINA ROBINSON HILL, *with an Introductory and Explanatory Geological Note, by* ROBERT T. HILL, of the United States Geological Survey.

INTRODUCTORY NOTE.—The importance of the French wine industry, and the great injury it has suffered in recent years from the ravages of the insect Phylloxera, are known to all. An industry which for centuries had been the support of thousands of farmers, has been almost devastated, within a few years, by the ravages of this small insect pest, which, like the Colorado potato bug, was an invader from America. Attacking the roots and leaves of the vines, it soon blasted them, and migrated from vine to vine, and vineyard to vineyard, with a certainty of destruction which, if not so sudden, was equally as appalling in its effects as the migrations of our own grasshoppers and army worms.

That an insect which originated in this country, and yet was so little known here, should cause such damage abroad, naturally aroused in the minds of the French scientists the advisability of studying the native American vines, and seeing if they could not find species which the Phylloxera did not infest, especially species indigenous to such portions of the United States as were the geologic and climatic analogue of France. It was for this purpose that Professor Pierre Viala, of the National School of Agriculture, was sent to this country by the French Minister of Agriculture. How ably he fulfilled his mission can be seen by a perusal of the following translation of his preliminary report, the original of which was published in January of this year.

The report is especially interesting to Texas in that it presents for the first time an intelligible discussion of our wild vines, and recognizes the true geologic character of our soils, and their relation to plant growth. Agriculture is the art of inducing and increasing the growth of plants required by man. All cultivated plants had their origin in the wilderness, and have reached their present perfection by means of human study and experiment. Agriculture is not the gathering of wild fruits, timber and other native vegetal products, but rather the resetting, cultivation, grafting, tillage, and other assistance to plant growth. Hence agriculture is the study and inducement of plant growth. Plant growth, wild or cultivated, is dependent upon the chemical ingredients and physical structure of the soil and climatic conditions. Soils owe their origin to the rocks of the earth's sub-structure, which are modified and changed by natural agencies, and the ultimate diversity of vegetation, such as exists between the different regions of Texas, is primarily due to the chemical and mechanical conditions of the fundamental stratigraphy. Hence, under favorable climatic conditions, the ultimate principles which underlie all agriculture can be understood only by a study of the rocks from which the soils are derived, their structure, composition and extent; this study once made, the after knowledge of methods for utilizing the conditions is but a question of application, and are more economically acquired and administered. This is the relation of geology to agriculture. It is much to our discredit that the only investigations of this character, concerning the varied soils of Texas, and their accompanying discussions, have been made by foreigners, and printed in foreign languages. Within the present generation our surveys have not recognized the importance of systematic economic investigation of the relations of soils to their geologic origin, and surely our agricultural and industrial development will always be retarded until this is done.

The important bearing of this paper upon our local agriculture is the fact that Monsieur Viala—an authority of undoubted eminence—brings out clearly the resemblance of the geologic conditions (upon which all agriculture depends) between the chalky lime formations of Texas and France—a resemblance which our American geologists and agriculturists have ignored, and which renders necessary a radical differentiation of methods of cultivation and of crops cultivated in Texas, from those usually taught in our American agricultural text books, which are mostly founded upon the non-chalky soils of the larger and entirely different portion of the United States. It is to the farmers of southeastern England, and of Charente and Champagne in France, whose lands are so much like the black prairie region of Texas, that our farmers west of the last Texas timber region must look for agricultural experience and instruction, and not to those of Massachusetts, New York, California, Georgia, or even eastern Texas, which are founded upon such radically different geologic conditions and accompanying derivative soils.

The immunity of our native vines from Phylloxera and other insect pests, is a reminder of the adaptability of our soils to viticulture. The day will surely come when the fallacy of excessive cotton growing, imported into the central and western portions of the State by immigration from the cotton belt, will be abandoned, and those regions will be devoted to the growth of crops for which, as scientific investigation will show, they are better adapted.

MISSION VITICOLE EN AMERIQUE.

Report to the Minister of Agriculture by M. PIERRE VIALA, *Professor of Viticulture at the National School of Montpelier, France.*

By order of March 16, 1887, you kindly conferred upon me the honor of a mission to the United States, for the purpose of searching for varieties of grape stocks found to grow in the marly and chalky formations.

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The failure of the attempts to cultivate the well known American vines, for the most part natives of the non-calcareous soils of the northern United States, as grafts or direct producers, in the chalky earths of Southern France, and especially of Charente, necessitates an investigation of the varieties of vines which flourish in calcareous and marly formations.

I omit details of the difficulties which I have been obliged to surmount during my explorations in the United States, (June 5—December 3, 1887) and in this note only review my observations relative to the special object of my mission, in order that the vine-growers may know of them as soon as possible. The many facts upon which the results rest will be developed in a later report, which will also contain other studies of the vine made by me in the United States, and will treat of diseases of the vine, viticulture, vinification, economic and commercial questions, etc.

The first information, secured at Washington from the Department of Agriculture, and from the Geological Survey, gave small hope of finding vines growing in purely chalky earth. The geographical distribution of the native species was little understood. It was known that in the immense country extending from Montana to southern Texas, and from the Rocky Mountains and the Mississippi to Tennessee, and even in eastern Pennsylvania, the greater part of the formation was Cretaceous, and did not contain a chalk comparable to that of Charente and Champagne. Such marly formations as exist were probably the result of the decomposition of rocks belonging to different geological formations distributed irregularly through all the States. My stay of six months in the United States permitted me to examine only a limited part of the country.

It was necessary to find: first, calcareous earths, if not identical with, at least comparable to the chalks and marls of France; secondly, native vines of vigorous growth in this medium. The vines should be able to resist the Phylloxera, be suitable to be grafted upon, and capable of being multiplied by cuttings. Finally it was desirable to distinguish in these species forms analogous to those already existing in France, in order to avoid unnecessary importations.

During the first part of my mission I explored different regions of New Jersey, Maryland, Virginia, North Carolina, New York and Ohio. The native varieties of these States, as well as of the north and the east in general, are: *vitis riparia*, *v. æstivalis*, *v. labrusca*, *v. rotundifolia*. The last variety, which is thought to grow only in the sandy and humid soils of the Atlantic coast, has little strength, as has been long known in France.

The *v. labrusca* (Linne) never attains a vigorous growth, except in the sandy earths, the rich alluvials, the fertile red earths. In poor soils—the yellow marls, for example—it is eventually destroyed by the Phylloxera. In the northern and eastern States, and where the winter is severe, the vine is killed at the very outset. In the southern States, even in sufficiently fertile soil, it soon dies after the attack of the insect. It is the same with the varieties directly derived from the *labrusca*.

The wild *æstivalis* (*v. æstivalis* of Michaux, and *v. bicolor* of Leconte) does not flourish in the sandy or rich alluvials, the fertile and porous red earths. Since the soil for this species should be dry, marly and calcareous, the vine has only a very feeble growth, although its roots are not affected by the Phylloxera.

The *vitis riparia* (Michaud), the most common variety from upper Canada to the limits of Indian Territory, and of which traces are found even along the borders of the rivers in southern Texas, acquires large growth in the United States only in very rich earth. In the alluvial and red clay earths the varieties have remarkable strength, with thick and glossy twisted leaves, but the trunk, although very strong, has not the strength of the southern species. When the soils are studied, in which the numerous forms, simple or complex, of the *v. riparia* cross themselves, it is evident that these are of value only in most fertile soils. I have never seen this species strong in marly earths, or in the white and dry lime formations. I have seen it a few times in the limestone soils at Kelley's Island, in Lake Erie, and then it was in the crevices of the compact limestones of the Devonian formation, or in the deposits of rich alluvium. Where the limestone debris prevailed, and also in the yellow marls at Sandusky, the plants were green. I have many times seen in the forests scrubs of the *v. riparia* with leaves crumpled with Phylloxera galls, and bearing numerous Phylloxeras on the roots, but I have never observed a vine of this species which perished from the direct action of the insect. The species of the northern and eastern United States have therefore no value for the Cretaceous and marly formations of France.

During the second part of my visit to the United States I went over Tennessee, Missouri, Indian Territory and California. Some important indications were seen in Tennessee and Missouri, but to establish them, it was necessary to go to Texas.

The *v. rubra* (Michaud), or *v. palmata*, is only found in isolated places in the dark and sandy alluviums of the Merrimac and Mississippi (twenty miles north of St. Louis and in Illinois). Because of its growth in these very fertile soils the vine has no value as a graft.

In southwestern Missouri, and in the northeastern part of Indian Territory, I have observed the *v. rupestris* and its various hybrids, *cordifolia-rupestris*, *riparia-rupestris*, and also the *v. Lincecumi*, Buckley.

Certain varieties of the *v. Lincecumi* (sometimes called "post-oak," or big-seeded æstivalis), are of value in the central regions of the United States wherever the black rot prevails, and where the mildew and the severe cold have rendered impossible the culture of European vines, and of certain American cuttings. Because of their feeble production in comparison with our native vines, their disagreeable taste, the fruit being dry and void of flavor, and of great inferiority, this variety can have but little value in the vine-growing districts of France.

Besides, south of the Missouri, especially in Arkansas, Indian Territory and Texas, this variety grows only in rich and sandy soils, and never in the white chalks and yellow marls. Its trunk attains great growth along the borders of rivers, in the black prairie lands, and in the rich cherty and sandy hills of the Indian Territory.

The *v. rupestris* (Scheele), which first appears in Tennessee and in western Missouri, extends south to Indian Territory and Texas, where it has numerous varieties. It grows only in the creek beds and arroyos, where trees do not occur. The beds of these ravines are composed of siliceous gravel and hard lime boulders, scantily mixed with alluvium, which makes a dry and sterile soil. The *v. rupestris* has a fine growth in this medium, and is always more developed than along the alluvial shores; its branches, which are devoid of basal leaves, run over the ground.

The hybrids of this last species, such as *cordifolia-rupestris*, *riparia-rupestris*, etc., grow in the same medium. They were first observed and imported into France by Mr. H. Jægar. They possess a vigor equal or superior to that of *v. rupestris* or of *v. riparia*. They sometimes grow in the crevices of limestones (Devonian or Jurassic), in which a little rich alluvium has accumulated.

All these forms are valuable for grafts in certain poor soils, but I have never observed their growth in Cretaceous formations. When the ravines in which the *v. rupestris* and its hybrids occur have a base of friable limestone, the vines perish.

The vines peculiar to Texas exist only in the lower Cretaceous limestones. This formation occurs in north Texas, from the Panhandle to the Rio Pecos, and from New Mexico eastward, where it is limited by a line drawn through Sherman, Dallas, Austin, San Antonio and Eagle Pass;* it rejoins the Rio Pecos in the latitude of

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* East of this line to the wooded region, including the black waxy white rock prairies of Collin, Dallas, and other counties, the formation is also Cretaceous, but it belongs to the upper member.

San Antonio. With the exception of some limited outcrops, (Carboniferous, Silurian and Cambrian,) all of this territory, judged by its fossils, belongs to the Cretaceous group, which extends into New Mexico, Colorado and Arizona. I have not been in these States, but in them many interesting observations could be made.

The soil is generally of the following nature: A surface of great plains, prairies of exceedingly fertile black land; the subsoil is a white chalk, crumbling, and of variable durability, but always soft, having generally a texture intermediate between the tufaceous chalk and the chalk proper (craie blanche) of Champagne. The subsoil is more or less deep, about five feet, but it often comes to the surface, where it washes rapidly and forms a white earth, mixed with fragments of the same nature, and having little vegetal humus. This results in a soil inferior in fertility to the chalky earths of Charente. The denudation of the subsoil, under these circumstances, is of great extent, sometimes producing slopes of hills (buttes) of 400 to 500 feet in height—for example, Comanche Peak, in Hood county. The grand plateaux which sometimes form the summits of these buttes are more fertile; the chalk is mixed with a reddish earth, and has numerous flint fragments, which are often found in situ in the underlying formations in the shape of nodules.

In these media there grow *v. Berlandiere*, Planchon; *v. cineria*, Engleman; *v. cordifolia*, Michaux; *v. candicans*, Engleman (mustang); *v. monticola*, Buckley; a new form, considered as a distinct species by Mr. T. V. Munson, the viticulturist, of Denison, Texas, the *novo Mexicana;* and numerous hybrids, resulting from the crossing between these species.

The *v. novo Mexicana*, T. V. Munson, first discovered in New Mexico by A. Fendler, the viticulturist, of Cambridge, often recalls forms of the *v. riparia*, and especially the Solonis. It grows, according to T. V. Munson, in the Panhandle. I have never observed any traces of it upon the border of the Red River. This vine grows in the soil of the Cretaceous age, but only where the dark earth has accumulated, or in the rich deposits on the banks ot the great rivers. In these formations Mr. Munson has observed the vine. It is also (perhaps because of its great vegetation) strong as a graft upon *cordifolia-rupestris*, *riparia-rupestris*, in less fertile soils, but it does not flourish in a soil of yellow marl, or of white limestone.

Of the same series of hybrids are the *champins*, which are a cross between *v. rupestris* and *v. candicans* (mustang grape), or of *v. rupestris* and *v. monticola* (Buckley). I have observed the first form, *rupestris* by *candicans*, in Johnson county, in the bed of the ravines some miles west of Cleburne. They grow in hard limestones sufficiently mixed with alluvium. The sprouts resulting from *v. monticola* and *v. rupestris* are very vigorous, and flourish in a soil of the same nature as the following variety.

The *v. monticola* of Buckley, (seen in herbariums of Philadelphia, Washington, New York and Cambridge), which is only the *v. Montana* of the same author, or the *v. Texana* of Mr. T. V. Munson, or the *v. Fœxeana* of Mr. J. E. Planchon, is found in very limited regions in southwestern Texas. Buckley has observed it in the counties of Bell, Burnet and Hays; Mr. T. V. Munson in Bell and Lampasas; and it is found in Uvalde county, in the extreme southwest. I have observed it in the counties of Bell and Lampasas. The *v. monticola*, Buckley, is clearly distinguished from the *v. Berlandiere* of Planchon. It is rare in certain counties, or it is found with only a feeble growth of trunk and branches. It was found upon the high plateaux. This variety, because of its feeble growth in the relatively fertile soil in which it grows, has small value in limestone soils as a graft; it has some value as a direct product, although its fruit is large and rosy white.

The geographical area of *v. candicans*, or mustang grape, includes all the southern part of Indian Territory from the Arkansas river, and extends across Texas into Mexico. It is the most vigorous of the vines of the United States. It attains a large growth only upon the banks of the rivers, Red, Trinity, Brazos, Rio Grande. It is found less often in the Cretaceous buttes, where it is much less vigorous, because of the great difficulty in the preservation of a cutting, even by special processes. Although it itself bears well the graft, and will resist Phylloxera, the mustang seems to me to have less value for the Cretaceous soils than the three following varieties:

The only varieties which a study of their growth in natural formations has made me regard as able to survive in the calcareous and marly earths are the *v. Berlandiere*, Planchon; the *v. cineria*, Engleman; the *v. cordifolia* (winter grape), Michaud.

I have already observed the *v. cordifolia* and the *v. cineria*, (some times called Wichita) in the calcareous soils or white marls, (crawfish soils or joint-clays), resulting from the decomposition of the Silurian and Devonian rocks, like those of Tennessee (at Pleasant View and Ashland, in the county of Cheatham), and of Missouri (near the villages of Beverly, Pleasant Valley, at the western extreme of Jefferson county).

These two species, as in the central States, do not extend beyond the Brazos river, which forms their southern limit. In the eastern

States they have a growth of trunk and branches superior to that of the riparias, especially in the rich and deep dark alluvials of Mississippi, but they keep green and strong in the dry and poor soils of Texas, where the soil and subsoil are formed of an exhausted white limestone, of which we have spoken above.

The *v. Berlandiere* (Planchon), which should not be confused with the *v. monticola* of Buckley, first appears, with certain rare exceptions, in Johnson county. This is the variety that, with the mustang, I have most frequently observed throughout all Texas, below the Brazos river, and even into Mexico, a dry region in which only the *v. cinerea* and the *v. cordifolia* exist. The *v. Berlandiere* prevails in the earth in which the soil and the subsoil are formed by the decomposition of cretaceous rocks, in which only certain rare plants grow, and remain green and vigorous, such as melia azedarach, live oak (quercus virens), smilax, juniperus Virginiana, etc. The growth of the *Berlandiere*, like that of *cordifolia* and *cinerea,* is stronger in fertile soils, but this vine does not become yellow in white limestones. Like the last two species, not only is it very strong against the Phylloxera, but it bears very well a graft in a chalky soil. I have seen many conclusive proofs of this fact at Belton, where certain two-year-old grafts of western vines upon four-year-old vines of *Berlandiere* were perfectly green, and of a beautiful growth in those poor soils.

The *v. cinerea* and the *v. cordifolia* of the chalky earths are especially abundant in the vicinity of the counties of Collin, Dallas, Ellis, Hill, Tarrant, Parker, Johnson, and particularly near the towns of Dallas, Fort Worth, Waxahachie and McKinney. The *v. Berlandiere* is abundant in the same formations, especially in the counties of Bell, Williamson, Travis, Hays and Comal, and particularly near the towns of Belton, Temple, Austin, St. Elmo, New Braunfels.

The forms of *v. Berlandiere* and of *v. cordifolia* which one observes in the limestones, have, as a small special characteristic, thick leaves, coriaceous, of a greenish yellow on the under side. The *v. cinerea,* in the same soil, has shorter and less cordate (heart-shaped) leaves; is more coriaceous with stiffer hairs upon the lower side.

The crossings between these three varieties, or between them and other forms, have a growth inferior to the type forms, and, in my opinion, are of no practical use.

Two varieties still remain for study in their natural soil—the *v. Californica* (Bentham), *v. Arizonica* (Engleman).

The *v. Arizonica* is confined to the States of New Mexico and

Arizona, which I have never explored. Some attempts at transplanting made in the vineyards of northern California with this variety, which I have seen, seem to me to possess qualities comparable, in the question of adaptation, to those of the rupestris. I have studied in the canons of southern Los Angeles the *v. Californica*, the greatness of whose trunk, and the strength of whose growth are equaled only by those of the mustang. This vine grows only in rich and new soils; it has little strength and color in poor and exhausted soils. The *v. Californica* will never possess great power of resistance to the Phylloxera, of which I have convinced myself by various experiments in the county of Napa. I have not observed the insects upon its leaves in the canons of southern California, where the Phylloxera has not yet invaded. I think the *v. Californica* will have a future in the vineyards of France. The California grape-growers for the most part, who follow the usual processes of our southern vineyards of France, transplant vines into fertile soil—almost exclusively with the varieties of *v. riparia*.

This is the only one of the vines, of value for grafts, which I have observed in limestone soils. The great aim of vine-growers of the east and northeast has always been to create new varieties strong against black-rot and mildew. The severe cold of winter has not permitted them to use the varieties of *v. labrusca,* adapted to those countries to which culture of the vine has been for a long time limited. The vine-growers of California, more favored by climate, have never adopted the stocks of the eastern United States, but they multiply the French varieties.

These reasons, with the custom of the people of eastern United States of adapting themselves to sour or sweet vines, make them accept all the new stocks put out nearly every day by nurserymen who hope to improve the *v. labrusca* by hybrids or seedlings.

Without entering upon long details of the actually new producing stocks, it should be said that the "*Niagara*" and the "*Empire State,*" the varieties of which have white and sour fruit, are inferior to the "Noah," and are already known in France. The Secretary loses nearly all its fruit from black-rot, and is destroyed by the Phylloxera. The "Montefiore" has no more strength than the "Clinton," of which it is the originator; without value also for our vine-growing country are the "Duchess," "Prentiss," "Beauty," etc. The "Yoakum" and the "MacKee" are no other than "Herbemont," and the "Robinson" seedling than the "Rulander." The "Iron Clad," which is far from possessing absolute resistance against the black-rot, is less fruitful than the European varieties, and yields a sour and valueless wine.

The "Othello" exists in the United States only in the collections, and is not appreciated, because the black-rot, the mildew and the curling of the leaves has rendered its culture impossible; the same is true of the "Triumph." In the United States little importance is attached to the "Canada" and "Brant," "Blake-Defiance," etc.

Upon my return from the United States, I am more convinced that, making exceptions for some direct products which have already been proved in the midst of France, we must depend entirely upon American grafts bearing our native varieties to ensure the reconstruction of our vineyards, and to maintain for French vines their legitimate reputation..

In review, and to clearly detach the practical results of the preceding indications, I conclude for the "calcareous and limestone soils" the *v. Berlandiere*, the *v. cinerea*, the *v. cordifolia* (all Texans) are the grafts which are most likely to thrive. These conclusions are based solely upon my observation of the soils in which the vines of the United States grow.

It may be that the facts which I have noticed may not be of the same nature when the vines are multiplied in France; but this I do not expect. It may be, also, considering the elasticity which certain varieties sometimes present in regard to adaptation to the soil, that other forms, such as *v. novo Mexicana*, *cordifolia-rupestris*, *champins hybrides*, etc., may possess value for cretaceous formations, but I do not think them very valuable.

The *v. Berlandiere*, the *v. cinerea*, the *v. cordifolia* have one defect —the type forms recover with difficulty from cuttings, though they multiply themselves by natural processes; but, with this exception, among the numerous varieties of these forms there may be certain ones which easily cling together after grafting, which it will be possible to successfully propagate, without great care, by those processes already applied in France, and very useful in the United States—that of cuttings, having each a bud, under simple glass frames. Doubtless it would be better to find vines that easily recover from cutting, but the other species or varieties, which possess these qualities, do not grow green and vigorous in cretaceous soils.

In conclusion, Monsieur Viala returns thanks to the U. S. Geological Survey and Department of Agriculture, but chiefly to Mr. T. V. Munson, of Denison, a modest Texas scientist, whose investigations of the native American grapes have brought much honor, save in his own country. Of this gentleman he says: "The disinterested counsels of Messrs. T. V. Munson and Herman Jæger have afforded me, in the chief part, a solution of the questions upon which I have reported, and I am happy to say that they have recognized my conclusions in presence of facts which would have gone against their commercial interests."